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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
PHILIPPE BOIRE, ET AL.	: EXAMINER: A.T. PIZIALI
SERIAL NO: 09/923,353	:
FILED: AUGUST 8, 2001	: GROUP ART UNIT: 1771

FOR: SUBSTRATE WITH A PHOTOCATALYTIC COATING

DECLARATION UNDER 37 C.F.R. § 1.132

COMMISSIONER FOR PATENTS
ALEXANDRIA, VA 22313-1450

SIR:

Now comes Bernard Nghiêm who deposes and states that:

1. I am an Engineer of the "Ecole Centrale de Paris," and I am a graduate of the University Pierre and Marie Curie, Paris VI, Paris, France. I received my Ph.D. degree in 1998 in the field of "fracture of glass at nanometric scale."

2. I have been employed by Saint-Gobain Recherche for the past 7 years, first as first as an Engineer in the department "transformation and properties of Glass", and second, since 2001, as the leader of research group in charge of CVD in the department "Thin coatings on glass."

3. I am the same Bernard Nghiêm who submitted the Declaration Under 37 C.F.R. § 1.132 that was originally filed on November 23, 2005 in the above-identified application.

4. I have read and am familiar with the specification of the above-identified application, i.e., pages 1-30 of the application as it was originally filed.

5. I have also read and am familiar with the subject matter of claims 25-30, 34-39 and 44-45, a copy of which are attached hereto as Exhibit 1.

6. The subject matter of claims 25-30, 34-39 and 44-45 is, *inter alia*, a substrate coated with a coating having photocatalytic properties and comprising titanium oxide at least partly crystallized in the anatase form.

7. The specification provides a description of such coated substrates as follows:

> The invention relates to glass-, ceramic- or vitroceramic-based substrates, more particularly made of glass, in particular transparent substrates, which are furnished with coatings with photocatalytic properties, *for the purpose of manufacturing glazings for various applications, such as utilitarian glazing for vehicles or for buildings*. [Page 1, lines 3-9; emphasis added.]
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> The object of the invention is a glass-, ceramic- or vitroceramic-based substrate, in particular made of glass and transparent, provided on at lease part of at least one of its faces with a coating with a photocatalytic property containing at least partially crystalline titanium oxide. [Page 2, lines 10-1.]
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> *It is obviously important for the coating to retain its integrity, even if it is directly exposed to numerous attacks, in particular during the fitting of the glazing on a building site (building) or on a production line (vehicle) which involves repeated handling by mechanical or pneumatic prehension means*, and also once the glazing is in place, with risks of abrasion (windscreen wipers, abrasive rag) and of contact with aggressive chemicals (atmospheric pollutants of SO_2 type, cleaning products, and the like). [Page 2, lines 26-36; emphasis added.]
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> However, the coating of the invention, which is *permanently self-cleaning*, also preferably exhibits an external surface with a pronounced hydrophilic and/or oleophilic nature which results in three very advantageous effects:. [Page 6, lines 11-15; emphasis added.]

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> In conjunction with a hydrophilic nature, the coating can also exhibit an oleophilic nature which makes possible the "wetting" of the organic dirty marks which, as with water, then tend to be deposited on the coating in the form of a continuous film which is less visible than highly localized "stains". An "organic dirt-repellent" effect is thus obtained which operates in two ways: as soon as it is deposited on the coating, the dirty mark is already not very visible. Subsequently, it gradually disappears by radical degradation initiated by photocatalysis. [Page 7, lines 11-21.]

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> The invention is thus targeted at the manufacture of glass, ceramic or vitroceramic products and very particularly at the manufacture of "self-cleaning" glazing. *The latter can advantageously be building glazing*, such as double glazing (it is then possible to arrange the coating "external side" and/or "internal side", that is to say on face 1 and/or on face 4). This proves to be very particularly advantageous for glazing which is not very accessible to cleaning and/or which needs to be cleaned very frequently, such as roofing glazing, airport glazing, and the like. It can also relate to vehicle windows where maintenance of visibility is an essential safety criterion. This coating can thus be deposited on car windscreens, side windows or rear windows, in particular on the face of the windows turned towards the inside of the passenger compartment. This coating can then prevent the formation of condensation and/or remove traces of dirty finger mark, nicotine or organic material type, the organic material being of the volatile plasticizing type released by the plastic lining the interior of the passenger compartment, in particular that of the dashboard (release sometimes known under the term "fogging"). Other vehicles such as planes or trains can also find it advantageous to use windows furnished with coating of the invention. Page 11, line 24 to page 12, line 22; emphasis added.]

8. In view of the description provided by the specification of the above-identified application, one skilled in the art would have concluded that the coating of the invention described therein and specified in the claims identified above was mechanically resistant and sufficiently adherent to the substrate in order to be used as a glazing. That this is so is demonstrated by, *inter alia*, the fact that the coating is described as "permanently self-

cleaning." In order for the coating to have that property one skilled in the art would recognize that it must be mechanically resistant and sufficiently adherent to the substrate in order to be used as a glazing. In addition, if the glazing is to be used as part of a building or automotive windshield, one skilled in the art would have recognized that a powdered coating that could be wiped off would be essentially useless.

9. I acknowledge that the specification of the above-identified application does not contain explicitly state that the coating is mechanically resistant and sufficiently adherent to the substrate in order to be used as a glazing. However, for the reasons discussed above, one skilled in the art reading that specification would appreciate that the coating of the substrates specified in claims 25-30, 34-39 and 44-45 of the above-identified application necessarily had those properties in order to be used as a glazing in the specification.

10. Referring to my previous Declaration identified above, the process parameters described by Vandiest for the deposition of large gap semi conductor like SnO_2 or TiO_2, starting from Ti or Sn tetrachloride with water as oxidant are only valid for the deposition of SnO_2. In the case of TiO_2, our own experiments and several scientific sources have proven clearly that even at low temperature TiO_2 powder is formed when $TiCl_4$ and water is brought into contact, instead of an homogeneous coating on the surface.

11. For those reasons, the process parameters described by Vandiest do not provide a coating of photocatalytic titanium oxide that is mechanically resistant and sufficiently adherent to the substrate in order to be used as a glazing as specified in claims 25-30, 34-39 and 44-45 of the above-identified application.

12. The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under

Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

13. Further deponent saith not.

Bernard Nghiêm

Date 17/05/06

APPENDIX 1

25. A coated substrate which is a glass, ceramic or vitroceramic substrate provided on at least a portion of one of its faces with a coating having photocatalytic properties, and comprising titanium oxide at least partly crystallized in the anatase form, and obtained by thermal decomposition of titanium precursors selected from the group consisting of organo-metallic precursors and metallic halide precursors, wherein said coating has a thickness between 5 and 50 nm, wherein the crystallized titanium oxide is in the form of crystallites with an average size of between 60 and 100 nm.

26. A coated substrate which is a glass, ceramic or vitroceramic substrate provided on at least a portion of one of its faces with a coating having a photocatalytic properties, and comprising titanium oxide at least partly crystallized in the anatase form, and a thin layer forming a barrier to alkali metals originating from the substrate, and located between said substrate and said coating, wherein the crystallized titanium oxide is in the form of crystallites with an average size of between 60 and 100 nm.

27. A coated substrate which is a glass, ceramic or vitroceramic substrate provided on at least a portion of one of its faces with a coating having photocatalytic properties, and comprising titanium oxide at least partly crystallized in the anatase form, and wherein said coating is hydrophilic, and has a contact angle with water below 5 after exposure to luminous rays, wherein the crystallized titanium oxide is in the form of crystallites with an average size of between 60 and 1000 nm.

28. A coated substrate which is a glass, ceramic or vitroceramic substrate provided on at least a portion of one of its faces with a coating having photocatalytic properties, and comprising titanium oxide at least partly crystallized in the anatase form, and wherein said coating has a root mean square (RMS) rugosity between 2 and 20 nm, wherein the crystallized titanium oxide is in the form of crystallites with an average size of between 60 and 100 nm.

29. Glass, ceramic or vitroceramic substrate provided on at least one of its faces with a coating having photocatalytic properties and containing at least partially crystalline titanium oxide and having a thickness between 10 and 80 nm.

30. The glass, ceramic or vitroceramic substrate according to claim 29, wherein said thickness is between 20 and 50 nm.

34. A coated substrate which is a glass, ceramic or vitroceramic substrate provided on at least a portion of one of its faces with a coating having photocatalytic properties and comprising titanium oxide at least partly crystallized in the anatase form, wherein said coating contains also at least one oxide with a lower refractive index than titanium oxide, the titanium content of the coating being at least 40%, by weight with respect to the total weight of oxides in the coating.

35. The coated substrate according to claim 34, wherein said titanium content is at least 50% by weight with respect to the total weight of oxides in the coating.

36. A coated substrate which is a glass, ceramic or vitroceramic substrate provided on at least a portion of one of its faces with a coating having photocatalytic properties and comprising titanium oxide at least partly crystallized in the anatase form, wherein there is at least a layer arranged between the substrate and said coating, said layer being electrically conductive.

37. A coating according to claim 36, wherein the conductive layer is selected from the group consisting of indium tin oxide, tin oxide doped with fluorine, tin oxide doped with antimony, zinc oxide doped with fluorine, zinc oxide doped with aluminium, zinc oxide doped with tin, tin oxides that are stoichiometrically deficient in oxygen, and zinc oxides that are stoichiometrically deficient in oxygen.

38. An electrically controlled variable absorption glazing wherein at least one of the external faces of said glazing is provided with a coating having photocatalytic properties and comprising titanium oxide at least partly crystallized in the anatase form.

39. A windshield wherein at least the face of said windshield turned toward the inside of the passenger compartment is provided with a coating having photocatalytic properties and comprising titanium oxide at least partly crystallized in the anatase form.

44. A coated substrate which is a glass, ceramic or vitroceramic substrate provided on at least one of its faces with a coating with photocatalytic properties, containing titanium oxide and doped by at least one metal selected from the group consisting of Nb, Ta, Fe, Bi, Co, Ni, Cu, Rh, Ce, and Mo.

45. The coated substrate according to claim 44, wherein the coating is deposited by reactive or non-reactive cathodic sputtering.